

**What Is Claimed Is:**

1                    1. A method of making a stackable microcircuit layer comprising  
2 the steps of:

3                    providing a plastic encapsulated microcircuit (PEM) that includes

4                    (a) a microcircuit having an active surface containing

5                    integrated circuitry and a bond pad, and

6                    (b) an encapsulant in contact with the microcircuit; and

7                    modifying the PEM to produce a modified PEM having a modified

8                    surface on which modified surface is exposed a conductive

9                    member that is electrically connected to the bond pad.

1                    2. The method of Claim 1 further comprising the step of forming an  
2 electrical lead on the modified surface of the modified PEM that leads from the  
3 conductive member to an edge of the modified PEM

1                    3. The method of Claim 1 wherein the microcircuit is a pre-tested  
2 microcircuit.

1                    4. The method of Claim 1 wherein the microcircuit is a burned-in  
2 microcircuit.

1                    5. The method of Claim 2 wherein the modifying step is  
2    accomplished through grinding.

1                    6. The method of Claim 2 comprising the further step of covering  
2    the electrical lead with an insulating layer.

1                    7. The method of Claim 1 comprising the further step of reducing  
2    the thickness of the modified PEM by thinning a backside of the modified PEM  
3    that is opposite to the electrical lead.

1                    8. The method of Claim 7 wherein the step of reducing the  
2    thickness of the modified PEM by thinning a back side of the modified PEM is  
3    accomplished through grinding.

1                    9. The method of Claim 1 comprising the further step of reducing  
2    the area of the modified PEM.

1                    10. The method of Claim 9 wherein the further step reducing the  
2    area of the modified PEM is accomplished by sawing the modified PEM along  
3    one or more edges.

1                    11. The method of Claim 1 wherein the conductive member that  
2    electrically connects to the bond pad is part of a wire bond.

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1                   12. The method of Claim 11 wherein the conductive member is a  
2 gold ball bond.

1                   13. The method of Claim 11 wherein the conductive member is a  
2 wire.

1                   14. The method of Claim 11 wherein the conductive member is a  
2 wedge bond.

1                   15. The method of Claim 11 wherein the conductive member is a  
2 lead frame.

1                   16. The method of Claim 1 wherein the conductive member that  
2 electrically connects to the bond pad is a conductive trace on a flexible  
3 substrate.

1                   17. The method of Claim 16 wherein the conductive trace is a  
2 flexible lead beam and the flexible substrate is a polyimide film.

1                   18. The method of Claim 1 wherein the PEM's encapsulant is a  
2 plastic body that at least partially encapsulates the microcircuit.

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1                   23. The method of Claim 22 wherein the modifying step comprises  
2 removing at least a portion of the solder ball.

1                   24. The method of Claim 23 wherein the removing of at least a  
2 portion of the solder ball is accomplished by heating the solder ball to form  
3 molten solder and wicking away the molten solder.

1                   25. The method of Claim 24 wherein the he removing of at least a  
2 portion of the solder ball is accomplished by shearing.

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1                   26. A method of making a stackable microcircuit layer comprising  
2 the steps of:

3                   providing a plastic encapsulated microcircuit (PEM) that includes:

4                   (a) a microcircuit having a bond pad,

5                   (b) a conductive lead assembly connected to the bond pad,  
6                   and

7                   (c) a plastic body encapsulating the microcircuit, the bond  
8                   pad, and at least part of the conductive lead  
9                   assembly; and

10                  grinding a top surface of the PEM to remove a top portion of the  
11                  plastic body along with at least part of the conductive lead  
12                  assembly to leave a planar section that contains the  
13                  microcircuit and the bond pad.

1                   27. The method of Claim 26 further comprising the step of forming  
2 an electrical lead on top of the planar section which leads from the bond pad of  
3 the microcircuit to at least one edge of the planar section.

1                   28. The method of Claim 26 wherein the grinding step also leaves  
2 a vestigial part of the conductive lead assembly in the planar section.

1                   29. The method of Claim 26 wherein the vestigial part of the  
2   conductive lead assembly is a part of a wire bond.

1                   30. A method of making a stackable microcircuit layer comprising  
2   the steps of:

3                   providing a plastic encapsulated microcircuit (PEM) that includes

4                   (a) a microcircuit having an active surface containing

5                   integrated circuitry and a bond pad,

6                   (b) a wire bond connected to the bond pad, a lead frame,

7                   and a wire that connects the wire bond to the lead

8                   frame, and

9                   (d) a plastic body that encapsulates the known good

10                  microcircuit, the wire bond, the wire, and at least a

11                  portion of the lead frame;

12                  grinding a surface of the PEM to remove the lead frame and the

13                  wire and form a modified PEM that contains the microcircuit,

14                  the bond pad, and the wire bond, the modified PEM having a

15                  modified surface on which modified surface is exposed the

16                  wire bond that is connected to the bond pad; and

17                  forming an electrical lead on the modified surface that leads from

18                  the wire bond to an edge of the modified PEM.

1                   31. The method of Claim 30 wherein the PEM has a package form  
2 factor known as a thin small outline package (TSOP).

1                   32. The method of Claim 30 comprising the further step of  
2 covering the electrical lead with an insulating layer.

1                   33. The method of Claim 30 comprising the further step of  
2 reducing the thickness of the modified PEM by thinning a backside of the  
3 modified PEM that is opposite to the electrical lead.

1                   34. The method of Claim 30 comprising the further step of  
2 reducing the area of the modified PEM.

1                   35. The method of Claim 34 wherein the further step reducing the  
2 area of the modified PEM is accomplished by sawing the modified PEM along  
3 one or more edges.

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- 1 36. A stackable microcircuit layer comprising:
  - 2 (1) a modified section of a plastic encapsulated microcircuit (PEM)
    - 3 that originally contained (a) a known-good microcircuit
    - 4 having a bond pad, (b) a conductive lead assembly
    - 5 connected to the bond pad, and (c) a plastic body
    - 6 encapsulating the known-good microcircuit, the bond pad,
    - 7 and the conductive lead assembly,
    - 8 the modified section formed by removing a portion of the
    - 9 conductive lead assembly from the PEM;
    - 10 the modified section having a modified surface,
    - 11 the modified section containing the known-good microcircuit, the
    - 12 bond pad, and a remaining portion of the conductive lead
    - 13 assembly with an end thereof exposed on the modified
    - 14 surface; and
  - 15 (2) a reroute lead on the modified surface of the modified section to
    - 16 connect the exposed portion of the remaining portion of
    - 17 conductive lead assembly with an edge of the modified
    - 18 section.

2                   37. The stackable microcircuit layer of Claim 36 wherein the  
3 commercially packaged microcircuit assembly has a package form factor known  
4 as a thin small outline package (TSOP).

1                   38. The stackable microcircuit layer of Claim 37 wherein the  
2 modified section is a planar section containing the known-good microcircuit, the  
3 bond pad, the remaining portion of the conductive lead assembly, and a  
4 reduced-height portion of the plastic body.

1                   39. The stackable microcircuit layer of Claim 38 wherein the  
2 conductive lead assembly originally comprises a wire bond, a lead frame, and a  
3 wire that are collectively encapsulated in the plastic body of the PEM, wherein  
4 the wire bond is formed on the bond pad, and wherein the wire connects the wire  
5 bond to the lead frame.

1                   40. The stackable microcircuit layer of Claim 39 wherein the  
2 remaining portion of the conductive lead assembly that is exposed on the  
3 modified surface is the wire bond.

1                   41. The stackable microcircuit layer of Claim 40 wherein the wire  
2 bond is exposed on the modified surface by grinding away a portion of the plastic  
3 body along with the lead frame, the wire, and a portion of the wire bond.

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1                   42. The stackable microcircuit layer of Claim 36 wherein the  
2 commercially packaged microcircuit assembly has a package form factor known  
3 as a micro-Ball Grid Array (uBGA) package.

1                   43. The stackable microcircuit layer of Claim 42 wherein the  
2 modified section contains the known-good microcircuit, the bond pad, the  
3 remaining portion of the conductive lead assembly, and the plastic body.

1                   44. The stackable microcircuit layer of Claim 43 wherein the  
2 conductive lead assembly originally comprises a conductive trace, a flexible  
3 substrate that supports the conductive trace, and a solder ball, a first end of the  
4 conductive trace connected to the bond pad and a second end of the conductive  
5 trace connected to the solder ball.

1                   45. The stackable microcircuit layer of Claim 44 wherein the  
2 remaining portion of the conductive lead assembly that is exposed on the  
3 modified surface is the second end of the conductive trace.